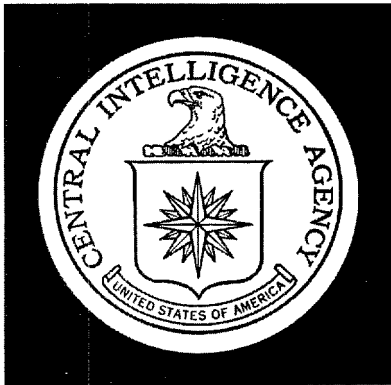


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DIRECTORATE OF  
INTELLIGENCE

# *WEEKLY SUMMARY*

## *Special Report*

A Review of the Japanese Space Program

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## A REVIEW OF THE JAPANESE SPACE PROGRAM

The Japanese, whose space program operates on a limited budget and is hampered by a division of effort between Tokyo University and a government agency, are ready for a second try to put a satellite in orbit. They have considerable experience in upper atmospheric research and, over the next few years, plan to put up both scientific and "utilitarian" satellites--for communication, navigational, and meteorological purposes. The Japanese have kept the cost of their space effort low by keeping their program modest. Small production runs have made unit costs high and total costs probably will rise substantially as more sophisticated rockets and support facilities are developed.

Launch Preparations

Japanese preparations to launch a small satellite on 19 December point up Tokyo's determination to move forward with an active space program. If the attempt is successful, Japan will be the fourth country--after the US, USSR, and France--to orbit a satellite with its own launch vehicle. In the first attempt last September, the satellite went out of control just before it achieved orbit. The launch vehicle for these attempts is the four-stage, solid-fueled Lambda 4-S rocket designed by Tokyo University scientists. This 55-foot rocket, presently Japan's most powerful launch vehicle, will carry an instrument package in its small, powered fourth stage.

The satellite--including both the instrument package and the burned-out fourth stage--will weigh about 57 pounds and is intended to go into an ellip-

tical orbit inclined about 31 degrees to the equator. The satellite, also designed by Tokyo University, will be equipped to make simple experiments in space and to radio the results to ground stations. A third launching using the same type of rocket is scheduled for March 1967.

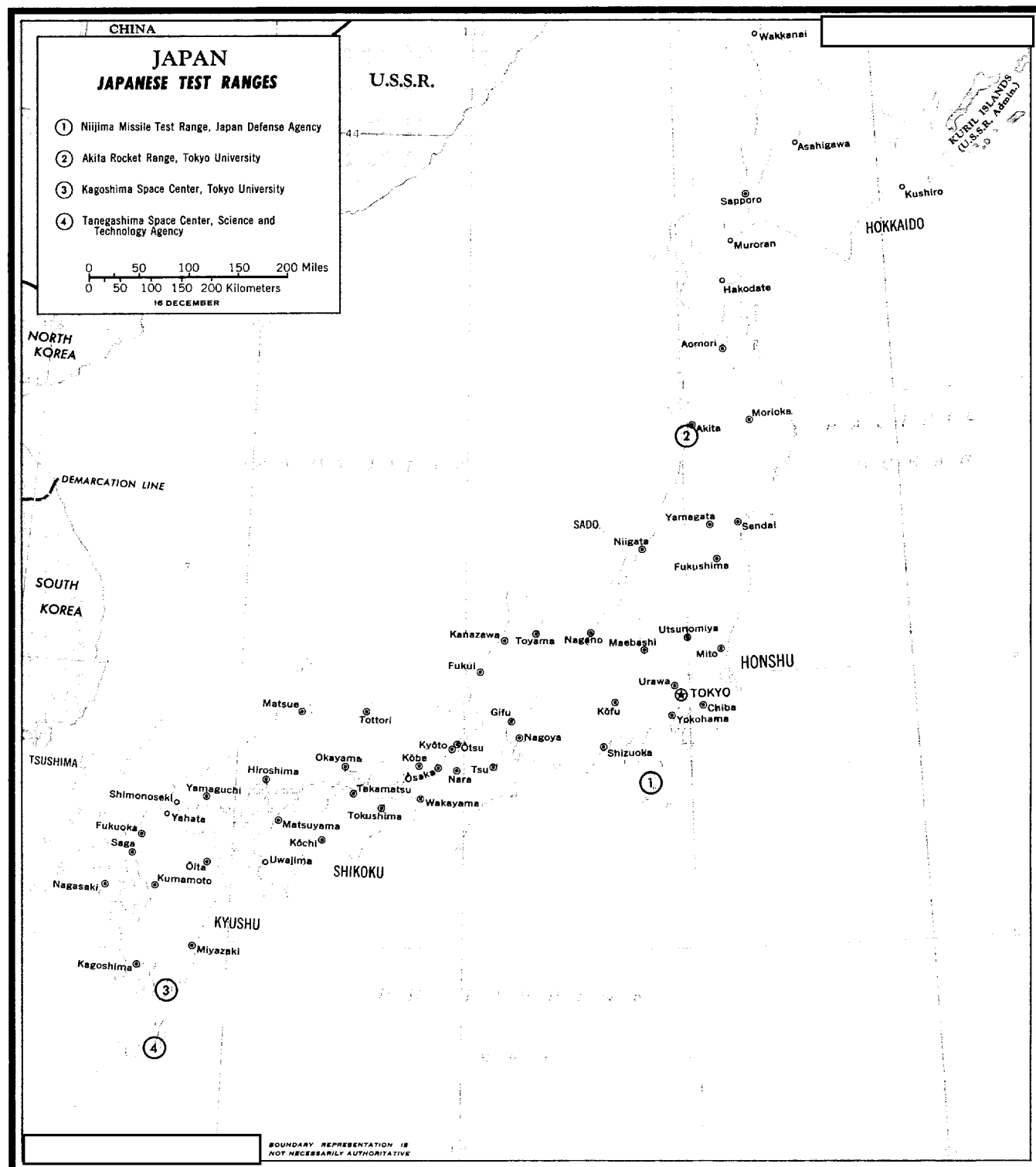
Japanese Space Research

Japan's space effort first got off the ground in April 1955 with the launching of a nine-inch-long "pencil rocket." For the past eleven years, the Japanese have maintained, on a modest budget, an active sounding rocket program. They have designed a variety of rockets and have developed a good capability for upper atmospheric research. Tokyo University took the lead in research and development on rockets. Its Institute of Space and Aeronautical Science has been responsible for most of Japan's space research, including the development of the solid-fueled

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Kappa and Lambda series rockets which are the work horses of Japan's space effort.

The Japanese Government did not take direct part in the space program until 1960. Since then, government interests have been represented by the Science and Technology Agency, whose efforts in space development thus far have been largely restricted to the development of meteorological sounding rockets and to research on liquid-fueled rockets. The government apparently is trying to tighten its control of Japan's space program, however, and has assigned the Science and Technology Agency a commanding role in developing and launching "utilitarian" vehicles--such as communications, navigation, and meteorological satellites--scheduled for the 1970s.

#### Division of Effort

Competition between the government agency and the university has hindered the development of a coordinated space effort. Two years ago, in an effort to bring order to the increasing number of research and development programs related to space, the government appointed Noboru Takagi, a pioneer in Japanese rocket development, to serve concurrently as the director of both space programs. This helped some, but a unified effort is almost impossible under the present organizational structure. A proposal to establish a new agency which would incorporate the facilities and personnel of both organizations, has not yet been acted on.

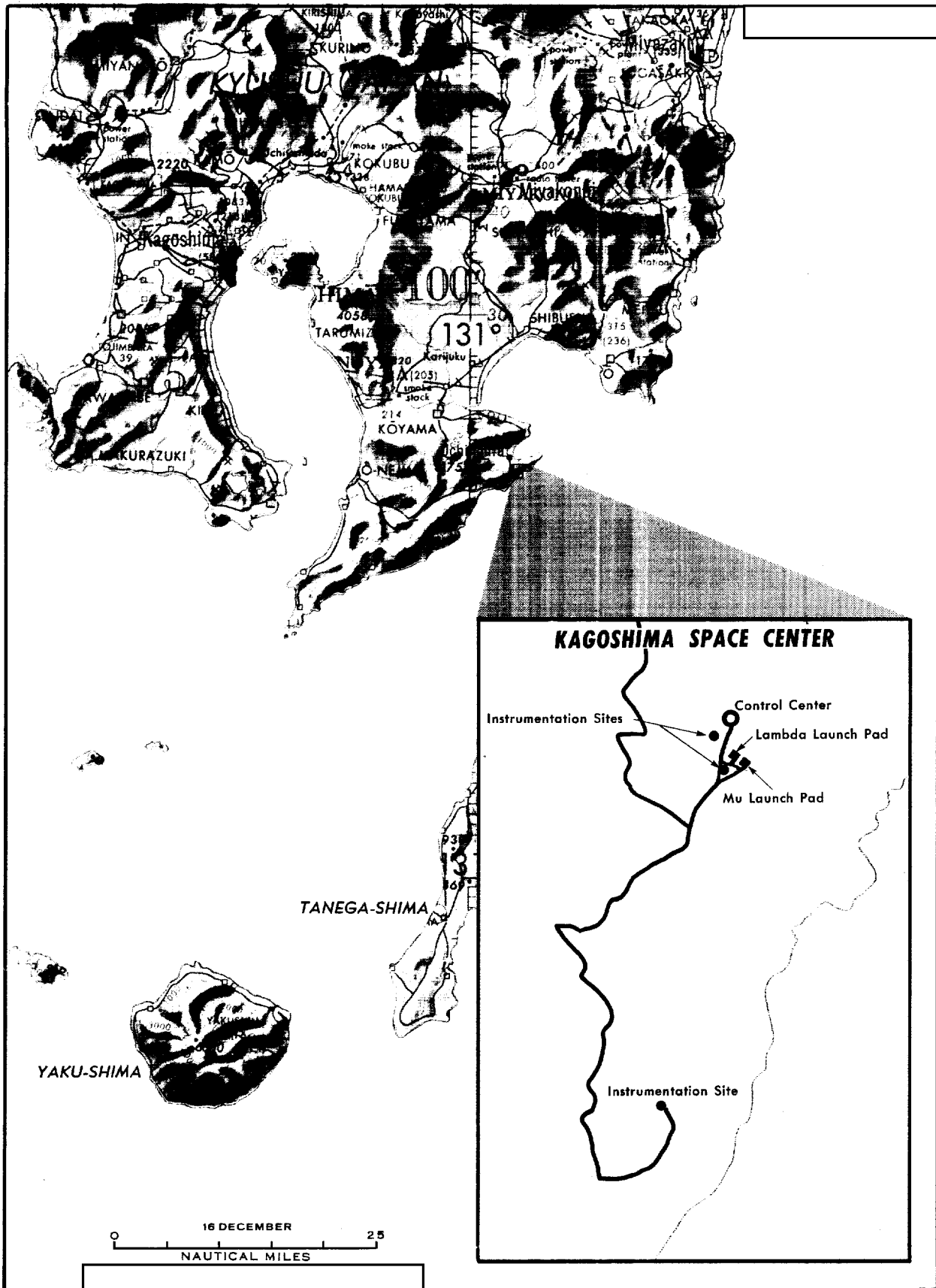
Such a step seems necessary for Japan to get the most efficient use of its limited allocations of manpower and funds for the space program.

Tokyo University has charge of the development of the Mu series of four-stage solid-propellant rockets. In October, the university successfully conducted the initial test flight of the first stage of the Mu. The test involved a live first stage and dummy upper stages. The launch vehicle is scheduled to be operational in 1967. By 1968 the Mu should give Japan a solid base for its satellite program by serving as the launch vehicle for a series of scientific payloads. Tokyo University is also charged with developing the scientific satellites to be launched by the Mu, and the first prototype now is being tested.

Despite its much smaller size, the Science and Technology Agency has been given the formidable job of developing a new and more powerful launch vehicle for the "utilitarian" satellite program. The agency has begun work on liquid-fueled rockets--a departure from Japan's current solid-fuel technology--and has had some success with small, liquid-fueled engines. The agency is also responsible for developing the "utilitarian" satellites, and given sufficient personnel and funds, they probably could design and build a communications, navigation, or meteorological satellite by 1970. Without a unified space effort, however, it is unlikely that Japan can

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develop a new space booster as a follow-on to the Mu by then. If Japan intends to stick to its 1970 launch schedule, the first satellites probably would be launched by an improved version of the Mu.

#### Launch Facilities

Japan's primary launch site, the Kagoshima space center near the southern tip of Kyushu, is run by Tokyo University and became operational in late 1962. It replaced the university's first launch site, the Akita rocket range on the northwest coast of Honshu. Rockets from the Akita site were fired west over the Sea of Japan but the range was too short for the increasingly powerful boosters.

Kagoshima is ideally situated for firing rockets over the Pacific, both south and east. The main facilities at the site are a launching pad for Lambda and Kappa operations, a control center, a rocket assembly and check-out building, and several instrumentation sites for tracking and communications. A second launching pad was recently built to accommodate the larger Mu rockets, and the first test flight involving all stages probably will take place in 1967.

The facilities at Kagoshima, while spartan by US standards, probably are adequate for the Japanese program over the next few years. However, in anticipation of the need for more extensive facilities capable of handling larger satellite launch vehicles, the Science and Technol-

ogy Agency recently picked Tanegashima Island as the launch site for the government's "utilitarian" program. The island is some 25 miles south of the Kagoshima Space Center. The facility reportedly will cover about 500 acres on the southern tip. The first facility there, a launch site for small rockets, is scheduled for completion next March. More extensive launch and tracking equipment is to be built by 1970.

#### Military Rocketry

The Niijima missile test range has been used by the Science and Technology Agency for launching a series of small, sounding rockets. The island launch site, south of Yokohama, began operations in late 1962 and has been used primarily for testing a variety of short-range military missiles, both guided and unguided. Air-to-air, surface-to-air, antitank, and tactical surface-to-surface missiles are under development.

At present, Japan is not undertaking strategic missile development. However, its increasingly sophisticated non-military rocket technology puts it in a strong position to move on to a strategic ballistic missile program should it choose to do so.

#### Program Costs

Since the start of its space program in 1955 Japan has spent only about \$60 million. The annual budget has risen from \$0.8 million in 1960 to \$11.2 million

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in 1966. This latter figure represents a 17-percent increase over 1965.

Despite low program costs, Japanese rockets tend to cost much more than their US equivalents. The conservative nature of the space program and its small size have kept total costs low but very small production runs and facilities too small to be efficient have kept unit costs high. Over the next few years Japan will require more sophisticated rockets and support facilities for planned efforts. As a result, total program costs will probably rise substantially, but the number of rockets required will most likely not increase proportionately. Therefore, there is unlikely to be any significant change in the tendency toward high unit costs.

#### The Future

Japan's plans call for the development of increasingly powerful vehicles to launch a variety of satellites, both scientific and "utilitarian." If these plans are carried out suc-

cessfully, the growing launch capability would allow Japan to move forward with an increasingly sophisticated space program.

The Japanese are shooting for the first launching in their "utilitarian" program in 1970, but it is still too early to determine if that schedule is realistic. Even if they use a foreign-built rocket or an improved version of the Mu for the initial launch vehicle, the designing, testing, and manufacturing of a workable "utilitarian" satellite could cause delays in the program.

Most important to the success of the space effort over the long term will be Tokyo's progress in coordinating the work of Japan's two competing groups of space scientists. This will become increasingly important as the diversity and complexity of the Japanese space programs burgeon. Moreover, the rising costs of the program anticipated over the next few years could be offset in part by the greater efficiency of a unified development effort.

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